

IN THE CLAIMS:

1. *(currently amended)* An optical coupling arrangement for providing a signal path into and out of a silicon optical waveguide formed in a surface layer of a silicon-on-insulator (SOI) wafer, the optical coupling arrangement comprising

a silicon-based prism coupler permanently attached to the SOI wafer in a manner such that a first, base surface of said prism coupler is disposed substantially parallel to, and mated with, an upper waveguide surface of said SOI wafer, the prism coupler including ~~a at least one~~ a cavity formed within the first, base surface wherein the refractive index of said silicon-based prism coupler at least equal to the refractive index of said silicon optical waveguide; and

an evanescent coupling region disposed between said silicon-based prism coupler and said silicon optical waveguide.

2. *(original)* An optical coupling arrangement as defined in claim 1 wherein the thickness of the silicon optical waveguide is less than 1  $\mu\text{m}$ .

3. *(original)* An optical coupling arrangement as defined in claim 1 wherein the silicon optical waveguide is configured to support propagation of a single mode optical signal.

4. *(original)* An optical coupling arrangement as defined in claim 1 wherein the silicon optical waveguide comprises a multi-layer structure of silicon-based layers, separated by relatively thin dielectric layers.

5. *(original)* An optical coupling arrangement as defined in claim 1 wherein a second, opposing surface of the silicon-based prism coupler is covered by an anti-reflective (AR) coating.

6. *(previously presented)* An optical coupling arrangement as defined in claim 1 wherein the silicon-based prism coupler and the silicon optical waveguide are formed to

include dopants of a predetermined species and concentration such that the refractive index of said silicon-based prism coupler is equal to or slightly greater than the refractive index of said silicon optical waveguide.

7. *(original)* An optical coupling arrangement as defined in claim 1 wherein the evanescent coupling region comprises a thin film layer of a material comprising a refractive index less than the refractive index of both the silicon-based prism coupler and the silicon optical waveguide.

8. *(original)* An optical coupling arrangement as defined in claim 7 wherein the thin film layer evanescent coupling region is formed as a surface layer across the first, base surface of the silicon-based prism coupler.

9. *(original)* An optical coupling arrangement as defined in claim 7 wherein the thin film layer evanescent coupling region is formed as a surface layer above the silicon optical waveguide layer within the SOI wafer.

10. *(original)* An optical coupling arrangement as defined in claim 7 wherein the thin film evanescent coupling region comprises a multi-layer structure.

11. *(original)* An optical coupling arrangement as defined in claim 10 wherein the multi-layer evanescent coupling region comprises at least one layer formed across the first, base surface of the silicon-based prism coupler and at least one layer formed as a surface layer of the SOI wafer.

12. *(original)* An optical coupling arrangement as defined in claim 7 wherein the evanescent coupling region comprises a thin film of a material chosen from the group consisting of: silicon dioxide, silicon nitride, silicon oxynitride and silicon carbide.

13. *(original)* An optical coupling arrangement as defined in claim 1 wherein the evanescent coupling region comprises a layer of relatively constant thickness.

**14. - 15. *cancelled***

**16. (*currently amended*)** An optical coupling arrangement as defined in claim 1 wherein the ~~at least one~~ cavity is formed using an etching process to form abrupt corner edges along the region where the cavity meets the flat bottom base surface.

**17. (*currently amended*)** An optical coupling arrangement as defined in claim 16 wherein an RIE etching process is used to form the ~~at least one~~ cavity with essentially vertical sidewalls.

**18. (*currently amended*)** An optical coupling arrangement as defined in claim 16 wherein an anisotropic wet chemical etching process is used to form the ~~at least one~~ cavity with angled sidewalls.

**19. (*original*)** An optical coupling arrangement as defined in claim 1 wherein the evanescent coupling region comprises a layer of tapered thickness so as to exhibit a predetermined small thickness in regions where only a small portion of incident light intensity is required to be transferred from the silicon-based prism coupler to the silicon optical waveguide, said thickness thereafter monotonically increasing as the fraction of light intensity transferred from said silicon-based prism coupler to said silicon optical waveguide increases.

**20. (*currently amended*)** An optical coupling arrangement as defined in claim 1 wherein the silicon-based prism coupler comprises a single trapezoidal geometry, a first facet of said coupler defined as an input coupler and a second, opposing facet defined as an output coupler, wherein the trapezoidal flat bottom surface is defined as the first, base surface of said prism coupler, said flat bottom surface disposed substantially parallel to the associated SOI wafer and including a ~~at least one cavity~~ formed therein.

**21. *cancelled***

**22. (previously presented)** An optical coupling arrangement as defined in claim 20 wherein the surfaces of the at least one cavity are coated with a material having a refractive index that is sufficiently low so as to permit total internal reflection at the corner edges.

**23. (currently amended)** An optical coupling arrangement as defined in claim 1 wherein the silicon-based prism coupler comprises a pair of trapezoidal prisms sharing a base surface disposed substantially parallel to the SOI wafer, a first trapezoidal prism defined as an input prism and including an input facet for use as an input coupler and a first cavity disposed along the shared base surface thereof, and a second trapezoidal prism defined as an output prism and including an output facet for use as an output coupler and a second cavity disposed along the shared base surface thereof ~~the pair of trapezoidal prisms sharing a first, base surface disposed substantially parallel to the SOI wafer.~~

**24. (original)** An optical coupling arrangement as defined in claim 1 wherein the silicon-based prism coupler is permanently attached to the SOI wafer by bonding the first, base surface of said silicon-based prism coupler to an upper waveguide surface of said SOI wafer.

**25. - 48. cancelled**

**49. (new)** An optical coupling arrangement as defined in claim 1 wherein the cavity within the base surface of the silicon-based prism coupler is configured to facilitate the attachment of said prism coupler to the surface of the SOI wafer.

**50. (new)** An optical coupling arrangement as defined in claim 49 wherein the cavity is configured to provide a clearance above a patterned surface of the SOI wafer while also providing physical contact between the silicon-based prism coupler and the SOI wafer.